GMCA Annual Meeting
Oct 17-19, 2018

Wednesday, Oct 17
Session 1 - 7 talks

Thursday, Oct 18
Session 2

A. Bed Bugs and Dog Detection
B. A Web-Based Review of EH Vector Control Services in the US
C. CDC Larval Collection For Adult Insect ID Key in Georgia
D. Requirement of the Gut Microbiota for Egg Formation in the Mosquito *Aedes aegypti*
E. Academic to the "Real World" – Annie Rich
    1. Grad student life can be very varied
        i. Lots of classes
        ii. Lots of research and outreach activities
        iii. Opportunity for teaching
    2. Real world
        i. Entomologist at Richmond County
            1. Unique program
                a. Lots of growth
                b. IMM
                c. Innovative
            2. Lots of changes that occurred rapidly
        ii. New experiences
            1. Surveillance
                a. Setting out traps
                b. Identification
            2. Building programs
                a. Building a tick surveillance program
                b. Working on educational program
                c. Learned the whole program
                d. Coworker training
            3. Working with the GDPH
                a. Resistance study
        iii. Differences/Similarities
            1. Differences
                a. Academia
                    i. Less predictable
                    ii. More flexible
                    iii. More time consuming
                    iv. Always on
                    v. One giant deadline
                    vi. Structured learning
                    vii. Constant influx of information
                    viii. Part of a group of entomologists
                    ix. Solo work
                b. Real world

i. Less flexible
ii. Easier to time manage
iii. Responsible for your own learning
iv. Build your own structure
v. Mixture of specialties
vi. Collaboration-based
vii. Dealing with the public

2. Similarities
    a. Research
        i. Record keeping
        ii. Data entry
        iii. Data analysis
        iv. Field work
        v. Mosquito rearing
        vi. Lab work
    b. Speaking
        i. Understand
        ii. Relate
    c. Networking
        i. Provides a knowledge pool
        ii. School contacts can help in the real world
    d. Budgeting/Funding
        i. Grants and proposals
        ii. Limited budgets
        iii. Collaboration is necessary
            1. Patience
            2. Networking
            3. Chain of command

iv. Connection
    1. Connection between academia and applied work is often lacking
    2. We need to collaborate and network with one another
        a. Innovations occur
        b. Need to be put to use
    3. GMCA can be a place where this connection occurs

F. Why heartworm is important to you – Andy Moorhead
1. Infection
    i. All ages are susceptible
    ii. Stages of *Dirofilaria immitis* (*https://www.heartwormsociety.org/pet-owner-resources/2014-03-24-22-40-20*)
        1. Adults in pulmonary artery
        2. Microfilaria
        3. Mosquito intermediate host
        4. Infectious L3
    iii. Undetectable until ~6 months after infection
    iv. Heartworm L3 burst through insect mouthparts and migrate through skin puncture (not injected)
2. Vertebrate host
    i. Life cycle

1. L3 deposited by mosquito
2. 3-4 days migration and molt to L4
3. Migrate through body to heart in 2-3 months and become adults
4. Adult stage to patency is 3-4 months
    a. Blood vessels thicken
    b. Damage causes multiple systemic issues
5. Produce offspring by about 6 months

ii. Symptoms
1. May be asymptotic
2. Symptoms
    a. Mild to moderate
        i. Chronic cough
        ii. Dyspnea
        iii. Decreased exercise tolerance
    b. Moderate to severe
        i. Syncope
        ii. Hemoptysis
    c. Severe – congestive heart failure

iii. Treatment
1. Can be hard on the animal
    a. Is time intensive
    b. Damage from worms persists
    c. Animal must be on exercise restriction
2. Prophylaxis is a much better option

3. Mosquito cycle
    i. Vectors
        1. >70 species
        2. 10-12 species are most important
    ii. Life cycle
        1. Pick up microfilaria (L1)
        2. Molts and migrates from L1 through L2 to L3
4. *Aedes albopictu*s has added to the burden
    i. Distributing animals throughout the country for rescues adds to the issue
    ii. Adding mosquito repellency/source reduction can be helpful
        1. Need collaboration between mosquito control and the heartworm society
        2. Both messages are needed

Session 3

A. Commercial Services for Mosquito Management – Larry Motes (Gregory Pest Solutions)
    1. Gregory Pest
        i. Founded in 1972
        ii. Privately held
        iii. 8 district offices across 12 States
        iv. 258 full-time employees
    2. Blood-sucking Arthropoda tending by type
        i. Mosquito work has increased 688% over the last 7 years
        ii. Flea work has flatlined

iii. Bed bug work has also increased

3. Educational approach
    i. No fear marketing
    ii. Smarterpestcontrol.com
4. Treatment areas
    i. Often places where the city or county does not spray
    ii. Fills a gap
5. Treatment types
    i. Barrier spray
        1. Pollinator issues
        2. Chemical trespass
        3. No spray zones
    ii. Training for employees
        1. No spraying edible plants
        2. No spraying flowers
    iii. Larval surveillance
6. Commercial side
    i. Can go where municipal programs can't go
    ii. Rely on vendors
    iii. Can sometimes get countywide plans
        1. Programs
            a. Public education
            b. Larviciding
            c. Citizen requests
            d. Adulticiding
                i. ULV
                ii. Thermal fogging
                iii. Barrier spray
            e. Emergency action plan
        2. Coordinate with GIS to map pertinent information
7. Clemson Cooperative Extension
    i. Bee keeper registration – https://www.clemson.edu/extension/beekeepers/about.html
    ii. Pesticide applicator portal - https://www.clemson.edu/extension/beekeepers/contact-us.html
8. Gregory also has Master Beekeepers on the staff to help people deal with bees by managing them instead of killing them

B. UGA IPM Coordinator: International IPM Symposium Summary – Ash Ahmad
1. Hilgardia, October 1959 - https://www.entsoc.org/PDF/2009/2009-IntegratedControlConcept.pdf
2. Kogan, 1998
    i. https://www.ipm.iastate.edu/files/curriculum/01%20IPM%20Introduction_0.pdf
    ii. http://www.ipmnet.org/ipmdefinitions/index.pdf
    iii. https://entomologytoday.org/wp-content/uploads/2015/02/marcos-kogan-ice-2000.pdf
3. Need to understand the biology and behavior of the insect in order to successfully use IPM techniques
    i. Pesticide applications become expensive

ii. Cause a rise in secondary pests
iii. Multifaceted approach needed

4. Summary
    i. IPM is a science-based, decision- making process
    ii. Identifies and reduces risks from pests
5. Symposium
    i. Started as a National IPM Symposium in 1994
    ii. Became the International IPM Symposium in 2006
        1. Held every 3 years
        2. 2018
            a. 25 countries represented
            b. 40 concurrent sessions
            c. Specialized day long workshop on ticks
            d. Achievement awards
                i. Student award – Annie Rich

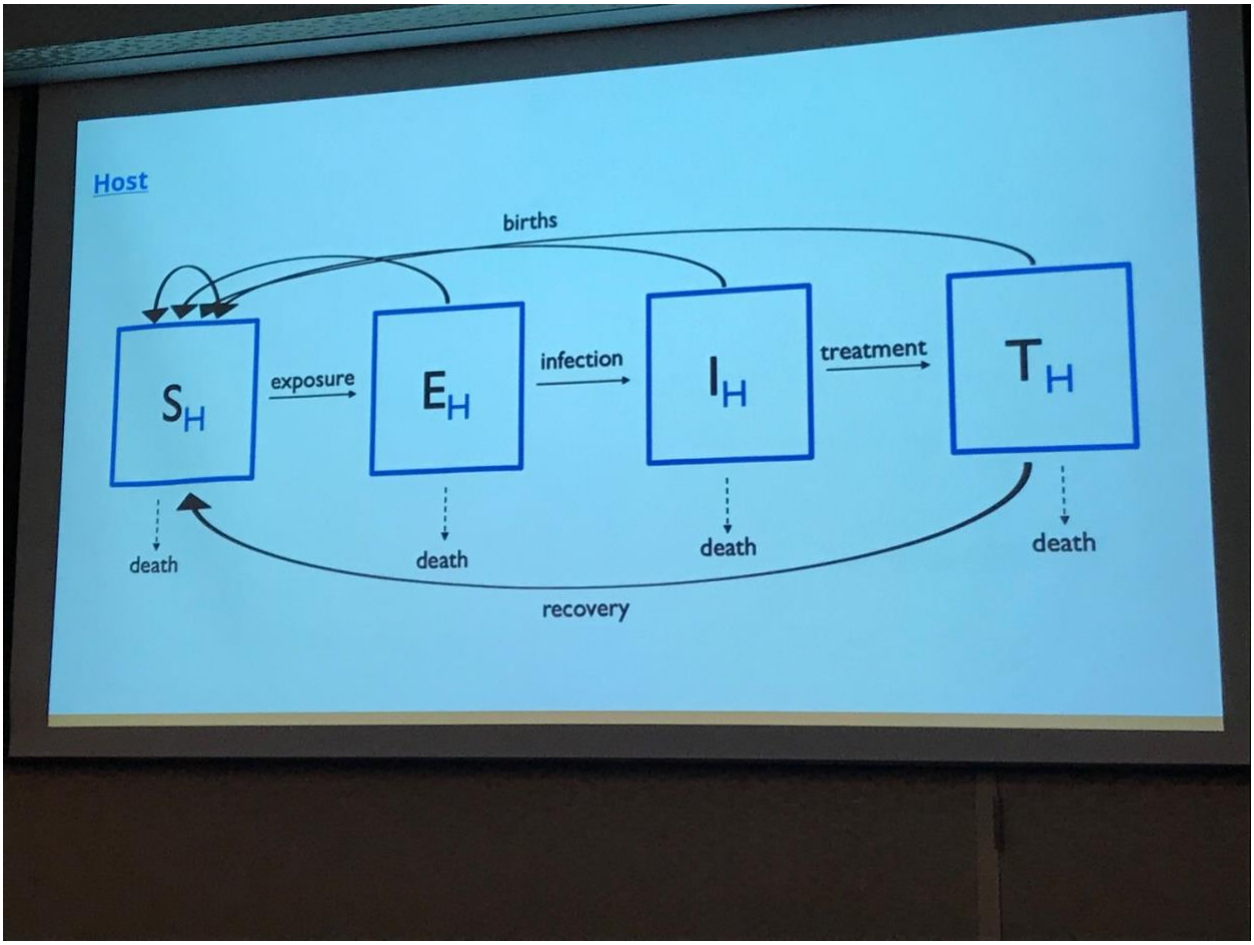
C. The Role of Environmental Temperature and Larval Habitat on Mosquito Ecology: From the Lab to the Backyard – Mike Newberry
    1. Microbiome - https://en.m.wikipedia.org/wiki/Microbiota
        i. Abiotic
        ii. Biotic
    2. Athens field project
        i. 9 areas
            1. Urban
            2. Rural
            3. Suburban
        ii. Larval habitat
            1. Rapid turnover due to environment
            2. Sampling effect
        iii. Adult surveillance
            1. Target *Aedes albopictus*
            2. Preserved for midgut microbiome analysis
        iv. Species composition
            1. Adult
            2. Larval
        v. Connect with community
            1. Provide information
            2. Educate people on breeding sites
            3. Create a positive image
    3. Looking for results
        i. Look at temperature fluctuations
        ii. Microbiome investigation

D. Assessing the Effectiveness and Performance of the Heartworm Disease Preventative: Vectra3D – Nikki Solano
    1. CEVA Animal Health
        i. Topical mixture of repellent and pesticide
        ii. Looking at effectiveness of product
    2. Compartmental model
        i. Host phases

1. Susceptible
2. Exposed
3. Infected
4. Treated

ii. Vector phases
1. Susceptible
2. Exposed
3. Infectious

iii. Lots of math



3. Looking for
i. Coverage needed to protect all animals in neighborhood
ii. Effect of different types of preventative with Vectra3D
iii. Pyrethroid resistance
iv. Multiple hosts
v. Multiple vectors

E. Animal Pests that Bother Humans – Nancy Hinkle
1. Biting Midges
i. “Punkies” “no-see-ums”
ii. Can cause sweet itch in horses
2. Black fly
i. “Buffalo gnats”
ii. Transmit diseases

3. Tabanids
    i. Horse and deer fly
    ii. Can transmit disease
4. Lice
    i. Host specific
    ii. Body live are no longer common
5. Bed bugs
    i. Do not transmit disease
    ii. Cause a lot of psychological issues
    iii. Can become a problem in poultry facilities
6. Kissing bug
    i. Common in the southeast
    ii. Do not defecate when feeding, reducing the risk of transmission of Chagas' disease
    iii. ½ of the population of Georgia possums were positive for the organism that causes Chagas
7. Fleas
    i. Cat flea is most common – wide host range
    ii. Flea allergy dermatitis
    iii. Diseases
        1. Bubonic plague
        2. Still found in the Western US
8. Mites
    i. Northern fowl mites
        1. Host specific – birds
        2. Very common
        3. Lots of misinformation concerning bird mites and people
    ii. Chiggers
        1. Larval stage of a free-living soil mite
        2. Natural hosts include lizards and snakes
        3. Skin swells up around mite
        4. Mites only survive about 24 hours on a human host, but the itch lingers
        5. Chiggers are not in Spanish moss
    iii. Straw itch mites (*Pyemotes*)
        1. Predatory
        2. Can not survive on humans
        3. Cause priorities papular dermatitis in horses
    iv. Oak leaf gall mite – not here yet
9. Ticks
    i. Most common tick is the lone star tick
        1. Larval stage (seed tick)
        2. Red meat allergy response to lone star tick feeding
            a. Alpha-gal
            b. Sugar, not protein
            c. Develops later in life
            d. Delayed hypersensitivity reaction
                i. Hives
                ii. Anaphylaxis
            e. May be blood type dependent

ii. Second most common is the American dog tick
iii. A new "potential" introduction – Asian Longhorned tick

F. Industry Spotlight
1. Marty Shuster – Target
2. Jason Conrad – UNIVAR

G. AMCA Update – Dennis Salmen
1. Annual meeting
i. Feb 25-March 1, Orlando
ii. Check GMCA website for additional meetings in the area
2. Train the Trainer program
i. Available online
ii. No longer funded by CDC
3. Young Professionals
4. Webinars

H. Effect of Passive Metofluthrin Emanators on Pyrethroid-Resistant *Aedes aegypti* – Mike Dunbar
1. Study done in Mexico
2. Rented houses in Merida
i. Experimental sites
ii. Sealed house to keep mosquitoes in
iii. Standardized furniture
iv. Ant baits at each entrance
3. Treatment
i. Passive emanator
ii. Confusant as opposed to a repellent
iii. Last ~28 days
iv. Tested 4 strains of aegypti
1. 2 susceptible
2. 2 pyrethroid-resistant
4. Methods
i. Release 25 females into houses
1. Do a landing count after 30 minutes
2. Add emanators to treatment houses
3. Do a landing count after 30 minutes
4. Do a landing count 24 hours after release
ii. Collect mosquitoes
5. Results
i. Resistant strain mortality did not differ
ii. Landing rates
1. No difference at baseline
2. At 30 minutes exposure to emanator, significantly fewer treated mosquitoes landed
3. Resistant strains began landing after 1 day
iii. Starting a study to look at emanators in actual houses
6. Current conclusions
i. Emanators do affect the landing rate of mosquitoes
ii. Emanators are well accepted by the human population

I. No Time for Titles … - Bobby Moulis
1. Mosquito Meter

i. Originally devised in 2009 for the Savannah Morning News
ii. http://mosquitocontrol.chathamcounty.org/Portals/MosquitoControl/SkeeterMeter.pdf
iii. Shows both nuisance and vector levels

2. Source reduction
    i. New equipment
    ii. Much source reduction is done at a dredge dump area in SC
3. Adulticiding
    i. ULV trucks
        1. New spray systems
        2. GeoTracker/Monitor 4 systems
    ii. Got a new helicopter
4. Surveillance –
    i. New species
        1. *Psorophora mathesoni*
        2. *Aedes japonicus*
    ii. Total numbers
        1. Peak in June 2018
        2. 2017 peak in Oct due to hurricane
    iii. WNV
        1. 141 WNV+ mosquito pools from 27 sites
        2. 3 WNV+ sentinel chickens (1 EEE+ chicken)
        3. 1 human case (blood donor)

Friday, October 19

A. Intersection of Public Health and Mosquito Control – Chris Rustin
B. A Quick Look at Next Generation Mosquito Control – Ture Carlson
    a. What's new?
        i. Gene drive
        ii. Chromosomal translocations
        iii. RNA interference
        iv. Amino acid/protein regulation
        v. Hormones
        vi. New modes of action
    b. No longer new
        i. Lethal genes
        ii. Wolbachia
    c. Gene drive
        i. Basics
            1. Altered gene from GM parent converts unaltered gene
            2. Altered gene takes over genetics
            3. Sterile male
            4. Working on an infertile female
        ii. Could all mosquitoes become sterile?
        iii. Target Malaria Project
            1. 4 step process
                a. Step 1 – confined lab studies
                b. Step 2 – confined small scale release

2. Village of Bana in Burkina Faso
3. Permission granted in 2018

d. Chromosomal translocations
    i. Unusual arrangement of chromosomes
        1. Lower reproductive ability
        2. Reduce ability to transmit pathogens
    ii. Research being done at UC Riverside
e. RNA interference
    i. RNAi stops a gene from being expressed
    ii. Short hairpin RNAi
    iii. Introduced into mosquitoes using yeast or *E. coli*
f. Amino Acid regulation
    i. Blood meal broken down to amino acids
    ii. Increase in amino acids activates egg development
    iii. Can this process be interrupted
        1. Would have to have essential AA
        2. Need a delivery system
g. Hormones
    i. Need to worry about specificity
    ii. Looking at ecdysone
    iii. Also looking at a pesticide approach to hormone control
        1. Pesticide target sites
        2. Ecdysis triggering hormone
h. New modes of action
    i. Allosteric modulators
        1. Mosquito dopamine receptors
        2. Benzodiazepines
    ii. Inward rectifier potassium channels
        1. Mosquito-specific
        2. Neurotoxin
        3. Non-lethal to bees

C. Current State of Honey Bee Populations – Jennifer Berry
a. Pollination
    i. Huge economic & enviromental consequences
    ii. Hives moved all over the country
        1. Follow the crops
        2. Must move bees after crops are pollinated
            a. No other food source
            b. Spraying occurs
b. Why are bees dying
    i. Varroa mites
        1. Jumped species
        2. Honey bee did not evolve with this mite
        3. Mites feed on bees fatty bodies
            a. Weakens brood
            b. Amplifies viruses, causing loss of balance between bee and virus
        4. Before mites, diseases came in through the mouth
        5. Mite bypasses evolutionary protections

ii. Pesticides
    1. Includes herbicides and fungicides
    2. Heavy losses are occurring
iii. All bees are declining
    1. In Germany, 78% of insect biomass have disappeared
    2. Insect-eating birds are also disappearing
    3. Why the decline
        a. Loss of habitat
        b. Loss of habitat diversity
        c. Pesticide use

D. President of the Georgia Beekeepers Association – Linda Tillman
    a. Know your bees
        i. Drone
        ii. Queen
        iii. Workers
    b. Bees are very tuned in to the world
    c. Life cycle
        i. Egg laid in cell
        ii. Larva
        iii. Covered cell with pupae
        iv. Adult
    d. Hive reproduction
        i. Egg laying female
        ii. Swarms
            1. Moderated by worker bees
            2. Younger bees go with swarm because they can make wax
    e. Worker bees
        i. Clean hive
        ii. Feed larvae
        iii. Build comb
        iv. Care for queen
        v. Ventilate hive
        vi. Forage
        vii. Guards
    f. Types of comb
        i. Brood
        ii. Honey
        iii. Pollen
    g. Bees are important pollinators
        i. Each bee hive visits over 500 million flowers a year
        ii. Bees have hairs all over their bodies
        iii. Body gets covered with pollen
            1. Collect pollen in pollen baskets on hind legs
            2. Comb it off their bodies with pollen comb
        iv. Collect nectar
            1. Reduce moisture in nectar to make honey
            2. Cap honeycomb

E. Savannah Bee Company

a. Works with non-profit to educate people about bees
    i. Awareness of bees
    ii. Glass educational bee hives in classrooms
        1. 420 school
        2. All 50 states
        3. 20 countries
b. Sells bee product and honey
c. People get very protective about their bees
d. Mosquito control and bee keepers need to work together

F. Summary of the Best Management Practices of Integrated Mosquito Management – Elmer Gray
    a. Mosquito control has changed a lot
    b. How does mosquito control want to be perceived
        i. Best management practices
        ii. Moving towards a more integrated approach
    c. IPM started as an agricultural solution
        i. Ecological approach
        ii. Unified program
        iii. All available techniques
        iv. Avoid economic damage
        v. Minimize side effects
    d. IMM
        i. Education/communication
        ii. Surveillance/mapping/action thresholds
        iii. Source reduction
        iv. Larviciding
        v. Adulticiding
    e. Equipment needs to be calibrated
    f. The label is the law
    g. Pollinator protection
    h. Need to work on educating about risk
    i. IMM also has a resource, need, palatability component

G. Open Discussion of the Intersection of Bee Keeping and Mosquito Control
    a. Education is needed on both sides
    b. Communication needs to be open on both sides
    c. Commercial applicators need to be included in the discussion
    d. Agricultural needs to be included as well
    e. Clemson Extension web site
    f. http://bees.caes.uga.edu/bees-beekeeping-pollination/pollination/pollination-protecting-pollinators-from-pesticides.html

Board Meeting

2019 Board

- President – Steve Pavlovich
- VP – Allen Hillman
- ST – Karen Farris
- Board

    - 1-year: Laura Peaty
    - 2-year: Tiffany Nguyen
    - 3-year: Doug Nelson
- Extension – Elmer Gray
- Public Health – Rosmarie Kelly
- Sustaining Member – Joe Strickhouser
- Past President – Joey Bland

Treasurers Report – we are in good shape
2019 meeting – Lake Blackshear
2020 meeting - UGA